DOCUMENT RESUME

ED 140 694 HE 008 954

AUTHOR Williams, John E.; Strickland, Wayne G.
TITLE The Importance of the Graphic Approach to Research in Higher Education.
PUB DATE Oct 76
NOTE 18p.; Paper presented at the Southern Conference for Institutional Research (Atlanta, October 1976)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Administrator Attitudes; Charts; Data; Diagrams; *Diffusion; Educational Administration; Graphs; *Higher Education; *Illustrations; *Information Dissemination; Information Utilization; Maps; *Research Utilization

ABSTRACT

The use of graphics as an effective method of data communication is discussed for various types of research reports in higher education. The need to display information in a concise format and the importance of the stratification of data are stressed. The authors illustrate and discuss some of the types of graphs that can be used to communicate concepts in higher education: for example, organization, process, trends, quantities, area, and location. Also examined are the results of a survey conducted for the purpose of determining the type of data communication preferred by educational administrators. (Author/MSE)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED140694

THE IMPORTANCE OF THE GRAPHIC APPROACH TO RESEARCH IN HIGHER EDUCATION

John E. Williams and Wayne G. Strickland

Office of Institutional Planning

Georgia State University

HE008954

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Paper Presented at the Southern Conference for Institutional Research

Atlanta, Georgia, October 28 - 29, 1976

ABSTRACT

This paper discusses the use of graphics as an effective method of data communication for various types of research reports in higher education. It stresses the need to display information in a concise format and emphasizes the importance of the stratification of data.

The authors illustrate and discuss some of the types of graphs which can be used to communicate concepts in higher education: e.g., organization, process, trends, quantities, area and location. The paper presents the results of a survey conducted for the purpose of determining the type of data communication preferred by educational administrators.

THE IMPORTANCE OF THE GRAPHIC APPROACH TO RESEARCH IN HIGHER EDUCATION

John E. Williams and Wayne G. Strickland
Office of Institutional Planning
Georgia State University

Introduction

The use of graphics in higher education is unique in that educational research requires a diversified means of graphical communication; this is due to the heterogeneous characteristics of the types of research conducted in higher education (e.g., budget studies, student studies, faculty workload studies, and administrative work). In contrast, this conflict is not present in most situations because organizations that utilize graphics or other means of communications normally convey the same type of information to common users.

William Bowman (1968), in his book Graphic Communication, states that "graphic communication needs no introduction. It has been with us for centuries under a variety of names" (p. 1). However, the authors of this paper wish to define graphics as they envision a graphical approach to research in higher education.

The graphical approach can be defined operationally as a method of data communication using charts, graphs, and illustrations which display information in a concise format and emphasize the importance of the stratification of data.

The manner in which information is presented makes a significant impression upon the comprehension of data and its ultimate impact on decision-making in higher education. Willard Brinton describes this point most aptly (cited in Young, 1966)

> If it were more generally realized how much depends upon the method of presenting facts, as compared to the facts themselves, there would be a great increase in the use of the graphic methods of presentation (page 387).

The complexity of problems that currently exist in higher education requires more succinct approaches to data presentation. Since significant relationships can be easily discerned from graphics, this approach could provide a means of ascertaining new facts about a problem and aid in developing new hypotheses.

In order to clarify data adequately through the graphical approach, the method of graphic presentation must be carefully chosen. After the method has been decided, then the researcher must select a particular type of graph or chart which can be used to support and emphasize his research analysis.

Some of the types of graphs which can be effectively used to communicate concepts in higher education are those illustrating organization, process, trends, quantities, area and location.

This paper will present the results of a survey conducted for the purpose of determining the type of data communication preferred by educational administrators.

It will be shown how the use of graphics in higher education enhances the conciseness, aids in the understanding, and helps to simplify data that the researcher wishes to convey to those utilizing his information.

It is much easier to focus on data interpretation through visual illustration. Bowman (1968) stated:

> . . . graphic communication draws upon the natural resources of its own language, and refers to visual experience as a source of principles and values for designing more articulate form. What is introduced, then, is . . . a way of seeing the graphic figure as a visual statement (page 1).

Types of Graphs

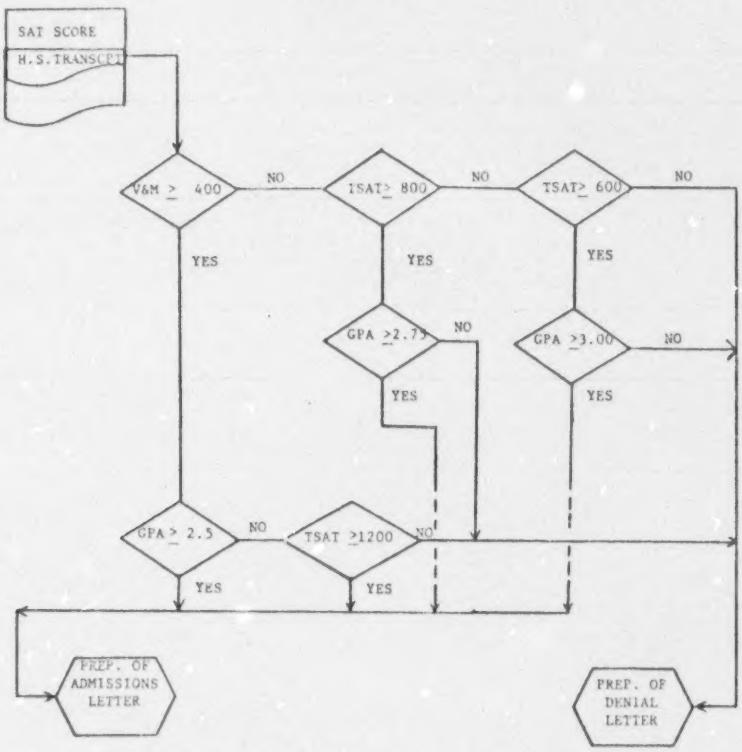
Organization

The first type of graph to be discussed concerns the portrayal of organization. Basically a graph of organization focuses on the interrelationships of various elements of an organization to the total organization. The parts of the organization have to be presented in the graph in a logical fashion.

There are several subtypes within the primary type--Organization. The authors, for the purposes of this paper, shall focus on the subtype which could be termed elementary/symbolic. The elementary/symbolic subtype defines subject components through conventional visual forms stressing the pattern of interrelationships.

A possible use of the elementary/symbolic organization graph in higher education is presented in a flow chart of a hypothetical decision-making process in an undergraduate admissions office (Figure 1).

Figure 1

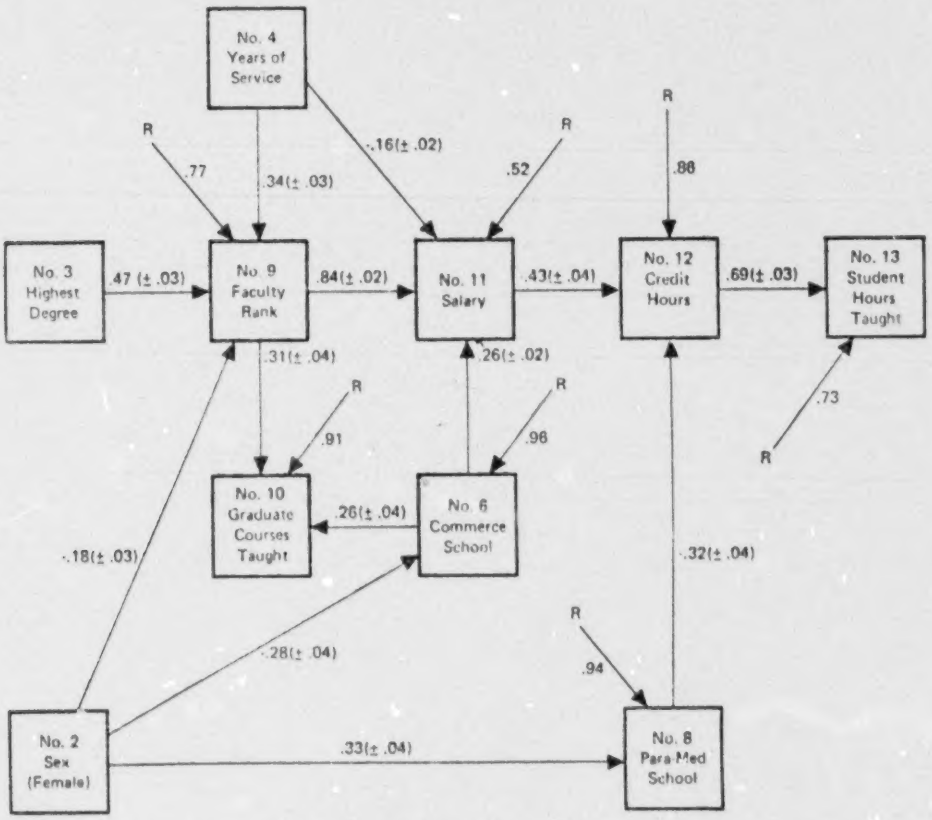


Process

The Process type of graphic presentation portrays a synergistic flow for problem solving and/or decision-making. Although the elements of the flow are examined independently, the ultimate focus is on the total process. A subtype of Process that can be utilized to graphically illustrate frequent cross-sectional aspects of problem solving in higher education is that of complex-interactive.

The example that is presented to define the complex-interactive process is "flow analysis". Flow analysis is a means of depicting an interactive process based on components or elements possessing varying weights and having different directions of flow. This graph basically illustrates the cause and effect of a series of variables on a final outcome (Figure 2).

Figure 2



Heuristic Model: Faculty Characteristics

From Prather and Smith, 1972: p. 61.

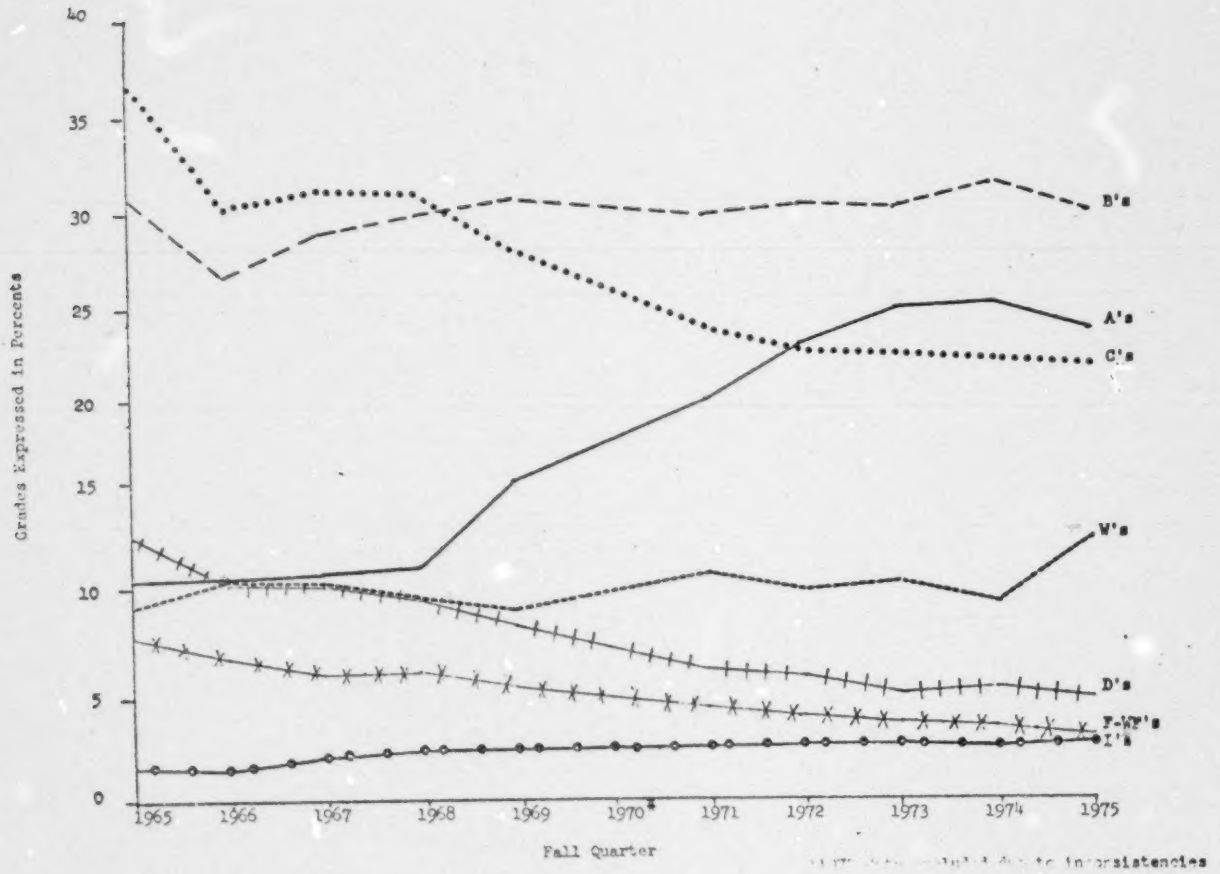
Trend

A Trend graph defines the change in a subject (s) over a finite period of time. The authors feel that the type of Trend graph which has the most potential for research in higher education is a differential Trend.

A differential graph simulataneously depicts the change in a subject and allows for visual differentiation through improving symbolic form on a trend line.

To illustrate the use of a differential graph, the change in faculty grading patterns over a period of ten years is presented (Figure 3).

Figure 3



From Prather and Smith, 1976: p. 3.

Division

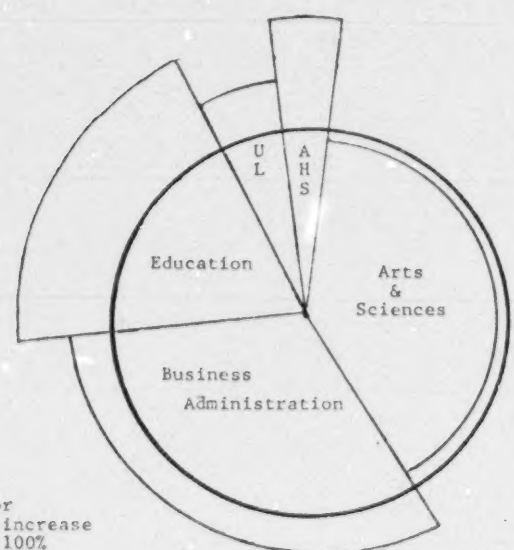
The Division graph presents the percentage of each segment composing a total quantity. An extended Division graph, as envisioned by the authors, illustrates the component parts of the whole amount through progressive increases or decreases of percentage contribution.

The Division graph, traditionally known as the "pie" graph, has potential beyond its most frequent use. While the pie has been utilized in the past to illustrate varying quantities (usually expenditures and revenues), its use in this fashion appears to be an under utilization of this type of graph. The authors would like to remind researchers employing this graphic technique that: (1) this graph is easily adjusted to illustrate quantities other than monetary values, and (2) the extended graph can show trends in amounts as well as static amounts.

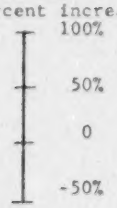
An example of a non-traditional use of the "pie" graph is portrayed in the extended graph. Shown below is the composition of enrollment by schools for the quarters of Fall, 1970, and Fall, 1974 (Figure 4).

Figure 4

Enrollment Increase in the
Five Major Schools at Georgia State University
Fall Quarter 1970 - Fall Quarter, 1974



Scale for
percent increase



Percent Increase by School

Allied Health Sciences	89%
Arts & Sciences	7%
Business Administration	34%
Education	82%
Urban Life	42%

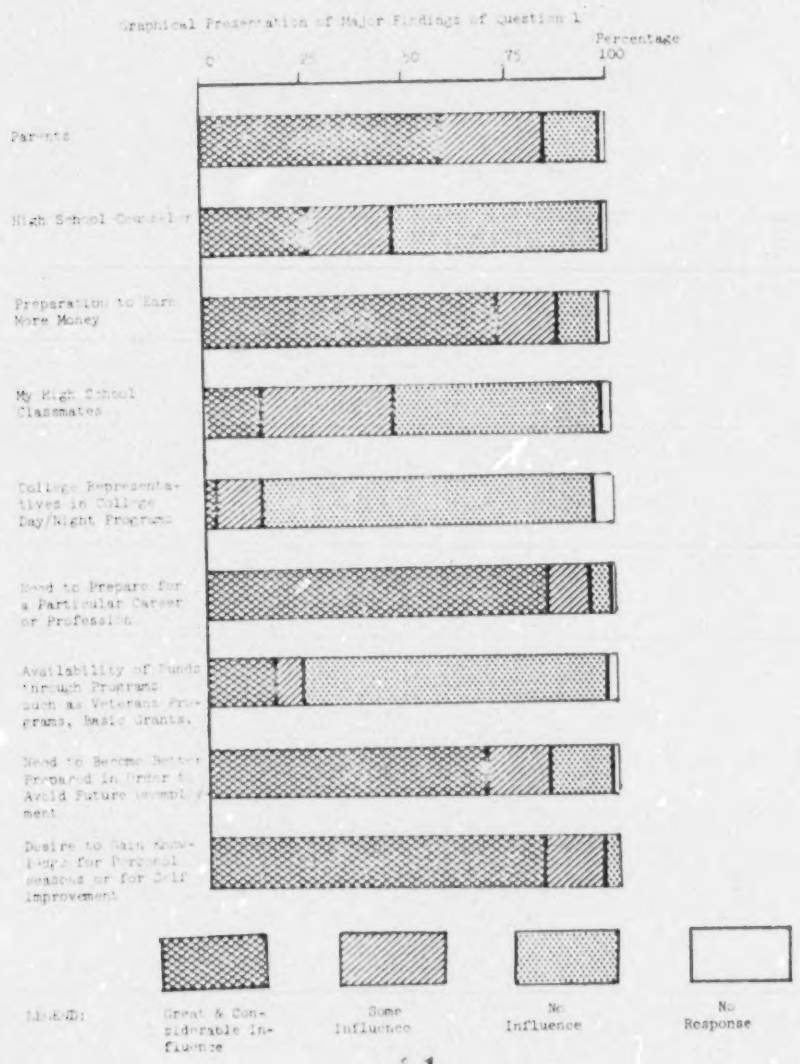
Source: Georgia State University Fact Book: 1975 - 1976, Office of Institutional Planning, Georgia State University

Quantity

The Quantity graph is used to present varying amounts of a subject in terms of some specified unit of measurement. Although this type of graph has been used extensively, thus far the potential for use in higher education has not been realized due to the lack of diversification in its use.

One type of Quantity graph that has lacked "creativity and diversity" in its use is the comparative-cumulative graph. An example of an efficient use of the comparative-cumulative type is a graph illustrating responses to a survey conducted among freshmen to determine their reasons for attending college (Figure 5).

Figure 5


Graphical Presentation of Major Findings of Question 1
Percentage
0
25
50
75
100
Parents
High School Counselor
Preparation to Earn More Money
My High School Classmates
College Representatives in College Day/Night Programs
Need to Prepare for a Particular Career or Profession
Availability of Funds through Programs such as Veterans Programs, Basic Grants,
Need to Become Better Prepared in Order to Avoid Future Unemployment
Desire to Gain Knowledge for Personal Reasons or for Self Improvement
Great & Considerable Influence
Some Influence
No Influence
No Response

From Williams, 1975: p. 4.

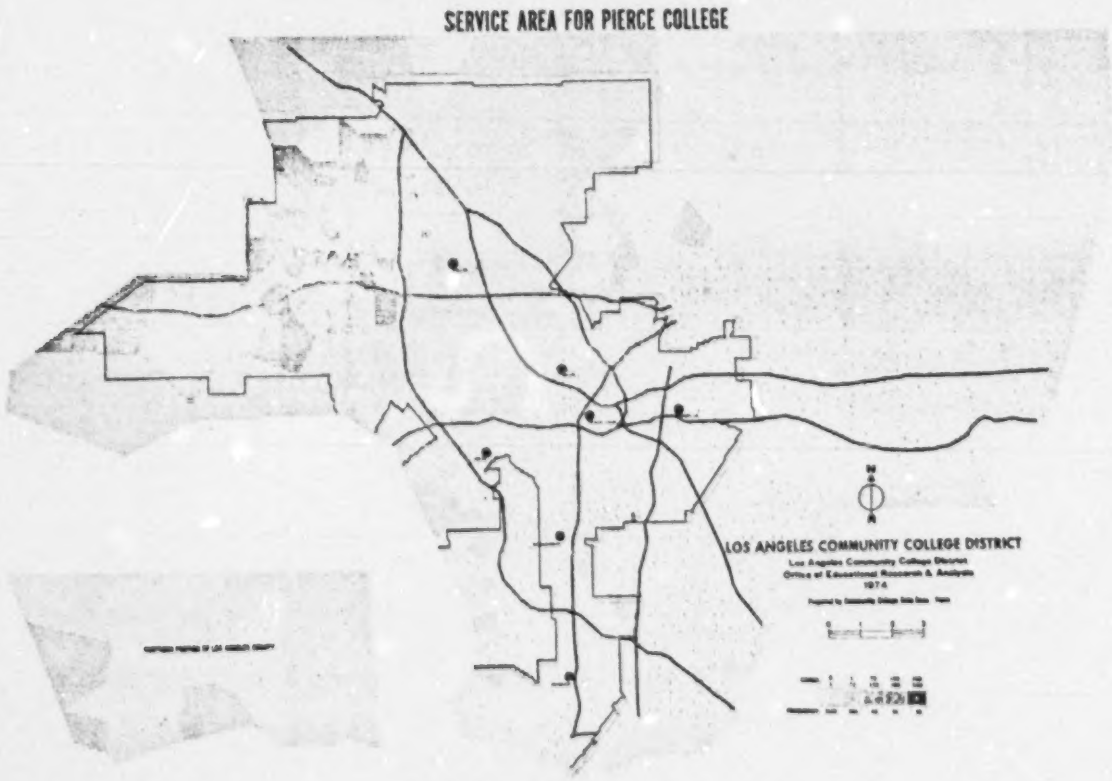
Area and Location

Area and location analysis as a graphic form involves isolating subjects in relation to geographic distributions. This form of graphics is essentially a "map" illustrating quantity characterization and movement.

The characterization map shows the location of a subject in an area through the use of symbolic form. Movement maps show intensity of the migration of subjects from one location to or from a focal point.

To examine the use of characterized graphs, a map of the location of students at Los Angeles Community College is presented (Landini & Bannister, 1974) (Figure 6). The use of the movement graph is depicted in a map showing the location of the last school attended by graduate students at G. S. U. (Figure 7).

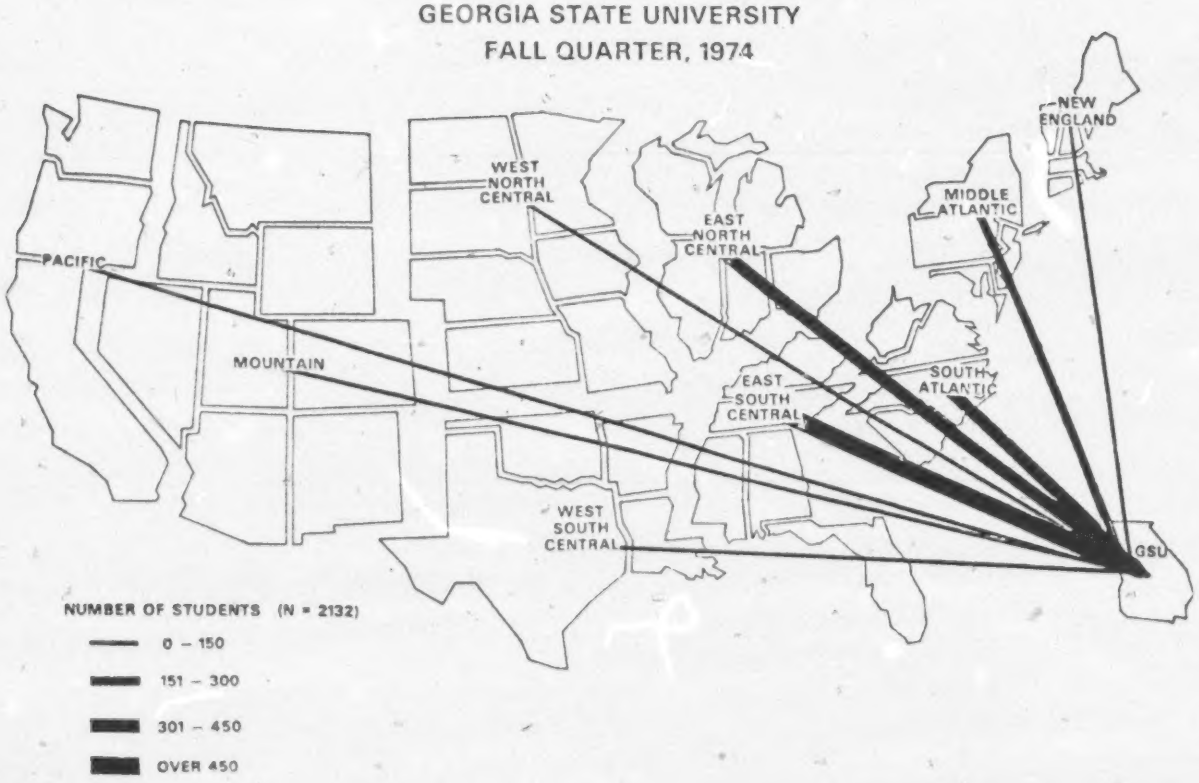
Figure 6



From Landini and Bannister, 1974.

Figure 7

REGIONAL LOCATION OF THE LAST COLLEGE
ATTENDED BY GRADUATE STUDENTS
GEORGIA STATE UNIVERSITY
FALL QUARTER, 1974



From Strickland, 1975: p. 91.

Perceptual Interpretation of Data Vs. Tabular Presentation

Tabular presentation of data requires the user to be more familiar with the values relating the subjects being measured. On the other hand, graphics allow the user to better understand the subject being measured by drawing on the user's visual sense. The graphic approach enhances the user's ability to grasp adequately the relative differences between values.

Precise data values cause the user to concentrate on particular values which may ultimately distract from the general theme; whereas, the essence of the central theme is inclusive within the graphical presentation. Then too, trend analysis (i.e., temporal analysis) is easier to portray through the use of graphics since the need to mentally interpret changes or movement across various time periods is simplified by enabling the user to visually perceive such movement.

Reports consisting of graphic support are more easily scanned or reviewed for their general theme (or results). Many administrators and other users of research reports often find it necessary to postpone reviewing reports because of (1) the lack of time, or (2) a general state of mental fatigue which does not permit in depth concentration. Since graphics usually require less concentration, the general idea of the report can be more readily understood.

Research reports that require the user to comprehend a subject which involves varying levels of emphasis can be made less difficult to interpret by employing various graphic techniques. These techniques focus

on the use of different shading patterns or different symbolic representations to aid the user visually in interpreting levels of emphasis.

For those researchers who sometimes describe their data in a narrative fashion, graphics can complement the discussion by strengthening the impact, increasing the clarity, and defining in more detail the subject being described.

At times the researcher finds it necessary to present data in tabular form in order to satisfy users' needs for specific values. Graphics can complement this tabular form by providing a "visual statement" that will enhance interpretation of specific values.

Additionally, graphic presentation improves overall efficiency of research communication through: (1) simplifying large masses of data, (2) making it possible for the user to refresh his/her memory of the various ideas within reports previously read, and (3) providing better utilization of physical space within a report.

The Results of a Survey Focusing on Preferences for Data Presentation

In an attempt to determine preferences of administrators, academic deans, and other users as to the forms of data presentation (graphic, tabular, etc.), the authors reviewed the results of a recent survey conducted at Georgia State University in the Office of Institutional Planning.

The survey was conducted in November, 1975 following the distribution of the G. S. U. Fact Book --1975-1976. The editor of the Fact Book surveyed the users of the book at the institution and received a 50 percent

response. The central purpose of the survey was to obtain an overall appraisal of the publication and suggestions for its improvement. Included under the suggestions for improvement was a section to determine the desired method of presentation. Generally, the results indicated that none of the respondents desired a reduction in the amount of graphics in the Fact Book, about 25 percent asked that the amount of graphics be increased, and 75 percent felt that the current amount of graphic usage was sufficient. [1]

This survey illustrates the fact that there is a desired increase in graphic usage by a sizable percentage of the users (25 percent). Perhaps those users desiring the same amount of graphics (75 percent) would be appreciative of an increase in the use of graphics if a more innovative approach to graphic presentation were employed.

Summary and Conclusion

It has been shown that the graphical approach to data presentation provides for efficiency through conserving physical space, saving user's time, and facilitating the reviewing of reports. Another point which was illustrated pertained to the fact that graphs can be used as a complimentary device for tabular, narrative, and other means of data description. In addition, the many types of graphs illustrated have provided an indication of the diversity of the use of graphics. Finally, it was shown that the use of graphs enhanced interpretation of data by simplifying large masses of information and by encouraging the user to employ visual perception.

---

1. In comparison with a number of institutional fact books, the G.S.U. Fact Book tended to utilize a larger number of graphs than did the others.

Various examples of current and past uses of graphs can be found in the publications of various research organizations (i.e., the Southern Regional Education Board, American Council of Education, and Institutional Research Offices in colleges and universities). Many of these examples do represent an attempt to employ graphs in higher education research. It is felt that neither creativity nor diversity is being maximized, and in most cases the institutional fact books and reports do not utilize graphics nearly enough.

The use of the graphics approach to research in higher education requires more knowledge of graphic and printing techniques. More time is involved in preparation of reports. However, those researchers who are interested in preparing reports that are easily read and interpreted should consider the advantages worth the effort.

Looking ahead, the use of graphics is expected to become more widespread among researchers and will be demanded more by users. One example of the widespread use of graphics can be observed in the area of computer science. In more recent years computerized graphics have become available through various computer service groups (such as IBM, Univac, and Control Data Corp.). This new specialty, generally known as computer graphics, indicates a realization on the part of computer technicians that graphics complement and enhance interpretation of the traditional tabular data that is generated by a computer.

It is hoped that this paper has illustrated the desirability and need for the graphical approach to research in higher education. In essence, the following quote sums up the argument of the authors, "a picture is worth a thousand words".

BIBLIOGRAPHY

American Council on Education, A Fact Book on Higher Education: Enrollment Data, Second Issue, 1975.

Bowman, William J., Graphic Communication, New York: John Wiley & Sons, Inc., 1968.

Dickinson, G. C., Statistical Mapping and the Presentation of Statistics. Second Edition. New York: Crane, Russak & Co., Inc., 1973.

Landini, Albert J. and R. Wayne Bannister, Student Residence Locations and Associated Enrollment Data. Office of Educational Research and Analysis, Los Angeles Community College District.

Prather, James E. and Glynton Smith, Faculty Grading Patterns, Report No. 76-12, Office of Institutional Planning, Georgia State University, April, 1976.

Prather, James E. and Glynton Smith, "Faculty Characteristics as Related to Teaching Workload: A Heuristic Model", Proceedings of the 12th Annual Forum of the Association for Institutional Research 1972.

Rogers, Anna C. Graphic Charts Handbook. Public Affairs Press, Washington, D. C., 1961.

Southern Regional Education Board, Fact Book on Higher Education In the South, 1970.

Strickland, Wayne G. Demographic Student Study for Planning, Report No. 76-4, Office of Institutional Planning, Georgia State University, September, 1975.

Williams, John E. Survey of Entering Freshmen Fall Quarter: 1975, Report No. 76-7, Office of Institutional Planning, Georgia State University, December, 1975.

Young, Pauline V. Scientific Social Surveys and Research. Fourth Edition, Prentice-Hall, Inc., 1966.